

WHAT IS CLAIMED IS:

1. A microbubble for the in vivo transport of physiological gases wherein the microbubble comprises at least one fluorocarbon gas and at least one modifier gas wherein the  
5 microbubble grows and shrinks to maintain osmotic equilibrium with the physiological gas saturation of the surrounding external medium.
2. The microbubble of claim 1 wherein the modifier gas saturation level changes in the bubble as the microbubble circulates.
- 10 3. The microbubble of claim 1 wherein the surrounding external medium is blood.
4. The microbubble of claim 1 wherein the microbubble comprises at least one fluorocarbon gas and at least one modifier gas while in vivo.
- 15 5. The microbubble of claim 1 wherein the physiological gases are at least one gas selected from the group consisting of oxygen, nitrogen and carbon dioxide.
6. The microbubble of claim 1 wherein the microbubble grows when the modifier gas of the  
20 microbubble exchanges with gases present in the surrounding external medium.
7. The microbubble of claim 6 wherein the physiological gas present in the surrounding external medium is oxygen.
- 25 8. The microbubble of claim 6 wherein the physiological gas present in the surrounding external medium is air.
9. The microbubble of claim 1 wherein the at least one fluorocarbon gas is selected from the group consisting of perfluoropropanes, perfluorobutanes, perfluorocyclobutanes,  
30 perfluoropentanes, perfluorocyclopentanes, perfluoromethylcyclopentanes, perfluorohexanes, perfluorocyclohexanes, perfluoromethylcyclopentanes, perfluorodimethylcyclobutanes, perfluoroheptanes, perfluorocycloheptanes,

perfluoromethylcyclohexanes, perfluorodimethylcyclopentanes,  
perfluorotrimethylcyclobutanes, perfluorotriethylamines, and sulfur hexafluoride.

- 5 10. A microbubble for in vivo delivery of physiological gases to an organism or tissues of an organism wherein the microbubble comprises at least one fluorocarbon gas and at least one modifier gas comprising oxygen wherein the microbubble grows or shrinks in diameter to maintain osmotic equilibrium with the surrounding external medium.
- 10 11. The microbubble composition of claim 10 wherein the fluorocarbon gas is perfluorohexane.
12. The microbubble of claim 10 wherein the microbubble grows in diameter to maintain osmotic equilibrium of oxygen within the microbubble with the oxygen in the surrounding medium.
13. The microbubble of claim 10 wherein the surrounding external medium is blood.
- 15 14. The microbubble of claim 10 wherein the one fluorocarbon gas is selected from the group consisting of perfluoropropanes, perfluorobutanes, perfluorocyclobutanes, perfluoropentanes, perfluorocyclopentanes, perfluoromethylcyclopentanes, perfluorohexanes, perfluorocyclohexanes, perfluoromethylcyclopentanes, perfluorodimethylcyclobutanes, perfluoroheptanes, perfluorocycloheptanes, perfluoromethylcyclohexanes, perfluorodimethylcyclopentanes, perfluorotrimethylcyclobutanes, perfluorotriethylamines, and sulfur hexafluoride.
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15. The microbubble of claim 10 wherein the microbubble further comprises a membrane.
- 25 16. The microbubble of claim 11 wherein the microbubble further comprises a membrane.
17. A microbubble composition for the in vivo transport of physiological gases wherein the microbubble comprises at least one fluorocarbon gas and at least one modifier gas wherein the microbubble first shrinks as a result of loss of the modifier gas to the surrounding
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medium and then grows as the microbubble gains osmotic equilibrium with the physiological gas saturation of the surrounding medium.

18. The microbubble composition of claim 17 wherein the modifier gas is selected from the group consisting of oxygen, nitrogen and carbon dioxide.

19. The microbubble composition of claim 17 wherein the transported physiological gas is oxygen.

20. The microbubble composition of claim 17 wherein the fluorocarbon gas is selected from the group consisting of perfluoropropanes, perfluorobutanes, perfluorocyclobutanes, perfluoropentanes, perfluorocyclopentanes, perfluoromethylcyclopentanes, perfluorohexanes, perfluorocyclohexanes, perfluoromethylcyclopentanes, perfluorodimethylcyclobutanes, perfluoroheptanes, perfluorocycloheptanes, perfluoromethylcyclohexanes, perfluorodimethylcyclopentanes, perfluorotrimethylcyclobutanes, perfluorotriethylamines, and sulfur hexafluoride.